Plant Archives Vol. 20, Special Issue (AIAAS-2020), 2020 pp. 496-499 *ISSN 0972- 5210*

CORRELATION AND PATH ANALYSIS IN BOTTLE GOURD [*LAGENARIA SICERARIA* (MOL.) STANDL.]

Abhishek[1], Vikash Rajput[1], Jitendra Kumar[2] and Saurabh Tomar[1,*]

[1]Department of Horticulture, CSAUAT, Kanpur - 208002 (UP), India

[2]Department of Vegetable Science, CSAUAT, Kanpur - 208002 (UP), India

Abstract

An experiment was carried at the Vegetable Research Farm Department of Vegetable Science, Kalyanpur, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur during *Kharif* season 2016. Correlation and path analysis among different characters of 52 bottle gourd genotypes were studied. Observations were recorded for the characters *viz*., days to opening of first male flower, days to opening of first female flower, Length of vine, Number of branches, Number of nodes/plants, Weight of fruit per plot, Number of fruits per plot, Fruit yield per plant. The fruit yield per plant had the positive and highly significant correlation with fruit yield per plot, whereas positive and highly significant association also observed between weights of fruit per plot with number of fruits per plot, length of vine with weight of fruit per plot. Fruit yield per plot, number of branches per vine, number of nodes per vine, days to female flowering, number of fruits per plot showed positive direct effect on yield days to male flowering, length of vine, showed negative direct effect. Major positive indirect effect on fruit yield was observing by days to male *via* number of branches per plant, days to female *via* number of branches per plant, length of vine *via* number of branches per plant, number of fruits per plant *via* fruit yield per plot.

***Keywords*:** Bottle Gourd, Correlation, Path Analysis and Fruit yield.

Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the most important cucurbits grown throughout the country for its tender fruits. It is also known as white flowered gourd or calabash gourd. It is a fast-growing winter seasonal climbing annual, native to Africa. It is grown in both rainy and summer seasons and its fruits are available in the market throughout the year. It is amonoecious and highly cross-pollinated crop known to good potential for yield components.

Yield is a complex character influenced by several genetic factors interacting with environment. Success of any breeding programme for its improvement depends on the existing genetic variability in the base population and on the efficiency of selection. For a successful selection, it is necessary to study the nature of association of the character in question with other relevant traits and also the genetic variability available for them. Correlation and path coefficient analysis are the important biometrical tools, which are being effectively used for determining the rate of various yield component's indifferent crops and leading to selection of superior genotypes. Therefore, for a rational approach to the improvement of yield, it is essential to have information on the association between different to have information on the association between different yield component and their relative contribution to the yield. Knowledge of such relationship is essential for selection for the simultaneous improvement of yield component and in turn to affect the yield. In this context the correlation studies assume special importance as it helps us about the genetic association of different characters with seed yield but correlation measures do not employ cause and effects inter relationship between yields. Path coefficient analysis as suggested by Wright 1921, on the other hand, gives a clear picture about cause and effect as it splits the correlation into the estimates of direct and indirect contribution of each character towards yield.

Material and Methods

The experiment was conducted at the Vegetable Research Farm Department of Vegetable Science, Kalyanpur, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur during Kharif season 2016, Geographically Kanpur is situated in the Gangatic alluvial of Central Uttar Pradesh between the 25.26º to 26.28º north latitude and 79.31ºto 80.34ºof east longitude about 125.9 Meter above sea level. The soil in which experiment was conducted, sandy loam with sufficient organic matter, coarse textured, well drained, friable and had a desired water holding capacity the soil content sufficient Potash and average level of Nitrogen and it was poor in Nitrogen content. Row distance was 3 meters with planting distance of 50 cm. All the recommended cultural practices were adopted to raise a good crop. The recommended dose of fertilizers @80:60:40 N: P: K per hectare was applied with 20 tonnes FYM per hectare was also applied 10 days before sowing. Half of nitrogen and full dose of phosphorus and potash was applied before the time of

*Corresponding author Email: chaudhary.csa@gmail.com

sowing while rest half dose of Nitrogen applied as top dressing at 45 days after sowing. All the intercultural and plant protection operations have been adopted as and when required for the success of the experiment. The data were subjected to analysis of variance as per the procedure described by Panse and Sukhatme (1985). Correlation and path coefficients were calculated according to method suggested by Miller *et al*. (1958) and Dewey and Lu (1959) respectively.

Results and Discussion

The analysis of variance of mean was carried out for various yield contributing characters namely; days to first male flowering, days to first female flowering, length of vine in meter, number of branches per vine, number of nodes per vine, fruit yield per plot (Kg), number of fruit per plot, fruit yield per plant (Kg) as present in table 1 which revealed that all the treatments differed significantly for all the characters showing that the material under study consists sufficient amount of genetic variability for the traits under study.

The genotypic and phenotypic correlation coefficients were worked out to measure the association among the pair of characters under study. The estimates of these correlation coefficients are presented in table 2. In general, the values of genotypic correlation coefficient were higher than of respective phenotypic correlations in most of the characters combination under study, which indicated that there was genetic cause for these associations.

Genotypic correlation coefficient: The positive and significant correlation of days to male flowering was observed with days to female flowering (0.938) and negative and significant with number of fruits per plot (-0.382), other characters showed non-significant resemblance with the trait. The positive and highly significant correlation of days to female flowering was observed with days to male flowering (0.900), negative and significant with number of fruits per plot (-0.253), other characters showed non-significant resemblance with the trait. The positive and highly significant correlation length of vine was observed with number of nodes per vine (0.996) and number of branches per vine (0.966), negative and significant with number of fruits per plot (-0.284). Other characters showed non-significant resemblance with the trait. The positive and highly significant correlation number of branches per vine was observed with number of nodes per vine (0.976), length of vine (0.890), negative and significant with fruit yield per plot (-0.580), number of fruits per plot (-0.463). Other characters showed non-significant association with the trait. The positive and highly significant correlation number of nodes per vine was observed with number of branches per vine (0.903), length of vine (0.901). Other characters showed non-significant resemblance with the trait. The positive and highly significant correlation fruit yield per plot was observed with fruit yield per plant (0.1.003) and number of fruits per plot (0.930). Other characters showed non-significant resemblance with the trait. The positive and significant correlation number of fruits per plot was observed with fruit yield per plant (0.927) and fruit yield per plot (0.233). Other characters showed non-significant interrelationship with the trait.

The genotypic correlation for fruit yield per plant with days to male flowering was negative and non-significant. The direct effect of this trait on yield was also negative and high which reduced the correlation value as non-significant and negative. Although the Positive and high indirect effect on yield via days to female flowering was observed. The genotypic correlation for fruit yield per plant with days to female flowering was negative and non-significant. The direct effect of this trait on yield was positive and which enhances the correlation value as positive and significant. The genotypic correlation for fruit yield per plant with length of vine was positive and non-significant. The direct effect of these traits on yield was negative and high which enhance the correlation value as positive and significant. Positive and indirect effect on yield via number of branches was notable, days to male flowering and also weight of single fruit. The genotypic correlation for fruit yield per plant with number of branches per vine was positive and non-significant. The direct effect of these traits on yield was positive which enhance the correlation value as positive and significant. Negative and indirect effect on yield via days to male flowering Fruit yield per plot showed positive and significant correlation with fruit yield per plant. The direct effect of this trait on yield was positive and high, which enhance the correlation value positive and significant. Positive and indirect effect on yield via number of branches was, days to male flowering and also number of fruits per plot. The genotypic correlation for fruit yield per plant with number of fruits per plot was positive and significant. The direct effect of this trait on yield was positive which enhance the correlation value positive and significant. The genotypic correlation for fruit yield per plant with number of nodes per plant was positive and non-significant. The direct effect of this trait on yield was positive and low. The results are in conformity with the findings of Dubey *et al.,* 2019, Tomar *et al.,* 2020b and Singh (1977) Saurabh *et al.,* 2017a.

Phenotypic correlation coefficient: The positive and significant correlation days to male flowering was observed with days to female flowering (0.900). Other characters showed non-significant interrelationship with the trait. The positive and significant correlation number of branches was observed with days to male flowering (0.938). Other characters showed non-significant association with the trait. The positive and significant correlation length of vine was observed with number of branches per vine (0.890), number of nodes per vine (0.901). Other characters showed non-significant resemblance with the trait. The positive and significant correlation number of branches per vine was observed with length of vine (0.966), number of nodes per vine (0.903). Other characters showed non-significant resemblance with the trait. The positive and significant correlation number of nodes per vine was observed with length of vine (0.996), number of branches per vine (0.976). Other characters showed non-significant resemblance with the trait. The positive and significant correlation fruit yield per plot was observed with Fruit yield per plant (0.0.988), number of fruits per plot (0.233), negative and significant with number of branches per vine (-0.580) other characters showed non-significant resemblance with the trait. The positive and

significant correlation number of fruits per plot was observed with Fruit yield per plot (0.930), fruit yield per plant (0.233), negative and significant with number of branches per vine (-0.463), days to male flowering (-0.382), length of vine (-0.284), days to female flowering (-0.253). Other characters showed non-significant resemblance with the trait. The finding is in accordance with those of Tomar *et al.,* 2015.

Since path coefficient specify the cause and determine their relative effects, hence it would provide a better index for solution rather than then the correlation. The path coefficient analysis was done to determine the direct and indirect effects on yield per plant days to first male flowering, number of branches, length of vine, days to first female flowering, fruit yield per plot, number of nodes per vine, number of fruits per plot. The correlation coefficients which arise due to linkage are pleitropic effect of gene is most important tool to select a character concerned through indirect selection.

In general, the genotypic correlation is same in direction but higher in magnitude as compared with phenotypic one which indicated that these correlations are due to pleiotropic effect of genes rather than linkage, the phenotypic correlation are no more important due to environmental effect. Hence, genotypic correlation is important for a plant breeder working for indirect selection of a character's improvement. The success of any breeding Programme is mainly depending upon the efficiency of selection. Selection cannot be applied on the basis of a single character because most of the characters are polygenic in nature and are influenced by each other. Therefore, it is necessary to study the natural of association of the character in question with other relevant traits. As such, knowledge of correlation is very essential in any breeding programme in the present study; correlation on phenotypic and genotypic levels. Between the yield and its components characters and characters themselves have been worked out and presented in table 2. The positive and significant correlation of days to male flowering was observed with days to female flowering and negative and significant with number of fruits per plot. The positive and highly significant correlation of number of days to female flowering was observed with days to male flowering. The positive and significant correlation length of vine was observed with number of nodes per vine and number of branches per vine. The positive and highly significant correlation number of branches per vine was observed with number of nodes per vine and length of vine. The positive and highly significant correlation number of nodes per vine was observed with number of branches per vine and length of vine. The positive and highly significant correlation fruit yield per plot was observed with fruit yield per plant, number of fruits per plot. The positive and significant correlation number of fruits per plot was observed with fruit yield per plant. In present study genotype correlation were same in direction as phenotypic once but higher in magnitude indicating that these correlations are might be due to pleiotropic effect of genes rather linkage. Positive and significant correlation of fruit yield per plant with fruit yield per plot and number of fruits per plot indicating that these characters can be considered for making selection for the during fruit yield per plant among character themselves. In present study only genetic correlation are considered over genotypic once because of its reliability. As phenotypic correlation contains more amount of environmental effect which are non-flexible. The finding is in accordance with those of Chaudhary *et al*., 1987; Tomar, 2020a; Ambesh *et al.,* 2017b; Pandita and Dahiya, 1986.

Conclusion

It could be concluded that the fruit yield per plant had the positive and highly significant correlation with fruit yield per plot, whereas positive and highly significant association also observed between Weights of fruit per plot with number of fruits per plot, length of vine with weight of fruit per plot. Fruit yield per plot, number of branches per vine, number of nodes per vine, days to female flowering, number of fruits per plot showed positive direct effect on yield days to male flowering, length of vine, showed negative direct effect. Major positive indirect effect on fruit yield was observing by days to male *via* number of branches per plant, days to female *via* number of branches per plant, length of vine via number of branches per plant, number of fruits per plant *via* fruit yield per plot.

References

Ambesh Kumar Jaiswal, Jagendra Pratap Singh, Saurabh Tomar, Abhishek and Nidhika Thakur (2017b). Effect of Seedlings Age on Growth, Yield Attributes and Yield of Tomato (*Lycopersicon esculentum* Mill.). *Int. J. Curr. Microbiol. App. Sci.,* **6(9):** 1521-1524. doi: https://doi.org/10.20546/ijcmas.2017.609.185

Chaudhary ML and Mandal G (1987). Correlation and path analysis in cucumber (*Cucumis sativus* L.). *Haryana Journal of Horticulture Science*, **16(3-4):** 269-273.

Dewey DR and Lu KH (1959). Acorrelation and path coefficient analysisof components of crested wheat grassseed production. *Agron. J.*, **51:** 512-515.

Dubey AK, Tomar S and Tripathi VK (2019). Transplanting schedule and types of Mulching contribution on Yield and Quality of Tomato (*Lycopersicon esculentum* Mill.). *Progressive Horticulture,* **51(2)**: 177-180**.**

Miller PA, Williams JE, Robinson HF and Comstock RE (1958). Estimatesof variance and co-variance in upland cotton and their implications in selection. *Agron. J.*, **50**: 126-131.

Pandita ML, Dahiya MS and Vashistha RN (1992). Correlation and path coefficient in round melon, research and development. *Reporter*, **7(1-2)**: 106-110.

Panse VG and Sukhatme PV (1967). Statistical methods for agricultural workers. ICAR, New Delhi. Pp. 97-151.

Tomar Saurabh, Singh Sanjive K, Dubey AK, Singh Jagendra Pratap and Abhishek (2017a). Role of Plant Hormones on Vegetative Growth of Tomato (*Lycopersicon esculentum* Mill.). *Int. J. Curr. Microbiol. App. Sci.,* **6(9):** 3319-3323. doi: https://doi.org/10.20546/ijcmas.2017.609.410

Singh HN, Srivastava JP and Prashad R (1977). Genetic variability and correlation studies in bitter gourd (*Momordica charantia*). *Indian Journal Agri. Sci.,* **47(2):** 604-607.

Tomar S (2020a). Performance of Cucurbitaceous Demonstrations in Central Plain Zone of Uttar Pradesh, India. *Indian Journal of Applied Research,* **10(6):** 1-3.

Tomar S, Beniwal D, Rajiv and Sourabh (2020b). Effect of time of planting and mulching on weed intensity in the Tomato (*Lycopersicon Esculentum* Mill.) Crop. *Indian Journal of Agricultural Sciences,* **90(10):** 1921-1924.

TomarS, Dubey AK, Singh SK and Ujjwal V (2015). Effect of different levels of NAA, GA_3 and 2,4-D on growth and yield of tomato (*Lycopersicon esculentum Mill*.). *Annals of Horticulture,* **9(1):** 97-100.

Table 1: Analysis of variance (MS) for 8 characters in bottle gourd (*Lagenaria siceraria*)

Source of variation	d.f.	Days of male flowering	Days to female flowering	Length of vine	Number of branches/vine	Number of Nodes	Fruit yield/ plot	Number of fruit/plots	Fruit yield/plant
Replication	2	0.922	0.391	0.686	3.083	15.890	1.796	9.813	0.569
Treatment	51	33.904**	36.422**	0.586**	3.585**	27.711**	10.759**	102.181**	1.436**
Error	102	0.897	0.901	0.156	0.939	5.087	0.711	50.422	2.927

Table 2: Genotypic (upper) and phenotypic (lower) correlation coefficient for eight characters in bottle gourd (*Lagenaria siceraria*)

S. No.	Characters	Days of male flowers	Days of Female Flowering	Length of vine	No. of Branches/ Vine	No. of Nodes/ Vine	Fruit Yield/Plot	No. of fruit per plot	Fruit yield/plant (kg)
1	Days of Male Flowering	$g^r p$	0.938	0.159	0.113	0.072	-0.122	-0.382	-0.137
2	Days of Female Flowering	0.900	$g^r p$	0.161	0.123	0.097	-0.063	-.253	-0.073
3	Length of vine	0.085	0.089	$g^r p$	0.966	0.996	0.010	-0.284	0.029
4	No. of Branches/ Vine	0.058	0.071	0.890	$g^r p$	0.976	-0.58	-0.463	-0.040
5	No. of Nodes/Vine	0.035	0.062	0.901	0.903	$g^r p$	0.007	0.026	0.009
6	Fruit Yield/Plot	-0.101	-0.048	0.007	-0.045	0.002	$g^r p$	0.930	1.003
7	No. of fruit per plot	-0.101	-0.067	-0.030	-0.066	-0.046	0.233	$g^r p$	0.927
8	Fruit yield per plant (Kg)	-0.110	-0.051	0.010	-0.0.36	0.006	0.988	0.233	$g^r p$

Table 3: Direct and indirect effect genotypic of different quantitative characters on yield in bottle gourd (*Lagenaria siceraria*)

S. No.	Character	Days of male flowers	Days of female flower	Length of vine	Number of branches	Number of Nods	Fruit yield /plot	No. of fruit/plot	Genotypic correlation with yield
1	Days of male flowers	**-0.010**	0.007	-0.032	0.020	0.004	-0.124	0.000	-0.137
2	Days of female flower	-0.009	**0.007**	-0.033	0.021	0.005	-0.064	0.000	-0.073
3	Length of vine	-0.002	0.001	**-0.204**	0.174	0.049	0.010	0.000	0.029
4	Number of branches	-0.001	0.001	-0.203	**0.174**	0.048	-0.058	-0.001	-0.040
5	Number of Nods	-0.001	0.001	-0.203	0.170	**0.050**	-0.007	0.000	0.009
6	Fruit yield per plot	0.001	0.000	-0.002	-0.010	0.000	**1.014**	0.001	1.003
7	No. of fruit per plot	0.004	-0.002	0.058	-0.081	0.001	0.943	**0.001**	0.924